Lamont-Doherty
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March 27, 1997

Dr. Joseph Kravitz, Program Officer
Office of Naval Research - Code 322GG
Department of the Navy
Ballston Centre Tower One
800 N. Quincy St.
Arlington, VA 22217-5660

Re: PERFORMANCE/FINAL TECHNICAL REPORT for -
High Resolution Seismic Surveying for Pleistocene
Sequence Stratigraphy, New Jersey Continental Shelf and
Upper Slope in Support of *Strataform*
Grant No. NOOO14-95-1-0200 and Expansion

Dear Joe:

We are pleased to enclose our Performance/Final Technical Report concerning the above-mentioned grant and its Expansion. Copies have also been sent to the individuals stated below, as outlined in the Grant Schedule.

If you require any further information, please do not hesitate to contact me at 914-365-8540, or via email: mountain@ldeo.columbia.edu.

We thank the Office of Naval Research for this award.

Very truly yours,

Gregory S. Mountain
Senior Research Scientist

enclosures

cc: Ms. Angela Potter, Resident Rep., Boston, MA
Director - Naval Research Lab, Washington, DC
(2) ✓Defense Technical Information Center, Ft. Belvoir, VA
Mr. William F. McCarthy, ONR OOCC1, Arlington, VA
Columbia University - Office of Projects & Grants
Ms. P. Stambaugh - Sr. Contracts Officer, Lamont-Doherty

Performance
Final/Technical Report

NOOO14-95-1-0200

"High Resolution Seismic Surveying for Pleistocene Sequence Stratigraphy, New Jersey Continental Shelf and Upper Slope, in Support of STRATAFORM"

Gregory Mountain[1], Peter Buhl[1], and Kenneth Miller[2]

[1]*Lamont-Doherty Earth Observatory of Columbia University*
[2]*Rutgers, the State University of New Jersey*

This contract provided support to plan, acquire, and process high-resolution multichannel seismic reflection data offshore New Jersey during cruise 270 of the *R/V Oceanus*. This was part of the STRATAFORM initiative that seeks geologic and geophysical data on the continental terrace at temporal and spatial scales ranging from 10^{-1} to 10^5 yrs and 10^{-2} to 10^3 m. Our cruise objectives were to collect high resolution reflection images of stratal geometry in the upper 100+ m of the sediment column from the middle shelf to the upper continental slope, and tie these to ODP Leg 150 sites cored and logged in 1993.

We designed a pre-cruise grid of profiles that crossed crucial tie points, maintained ≤2 km and ≤5 km track density in dip and strike direction, respectively, and overlapped several seismic lines collected in 1990. These older data were acquired with a larger airgun array, greater shot-receiver offsets, and a longer streamer (1500 m). "Nesting" these data types provides a direct comparison of the resolution potential of both acquisition systems, and with detailed study will lead to more accurate characterization of reflecting surfaces from meters to kilometers below the seafloor.

The endpoints of 54 reconnaissance lines were provided to John E. Chance & Assoc. (a private contractor that supplied the technical personnel and seismic hardware for this cruise) and a pre-programmed track plan was assembled for a computer display system that guided the helmsman throughout our cruise. Using StarfixII navigation (based on DGPS positioning), we remained within 25 m of our intended seismic line for 90% of the 1800 km of recon data we collected; 25% of the data were within 10 m of the intended location. An additional 300 line-km of data were similarly pre-plotted and acquired in 8 dense grids of data (as little as 150 m between adjacent lines) that were each centered on locations of proposed ODP drill sites on the middle to outer shelf. These data were needed to assess the hazards to drilling posed by the occurrence of shallow (10's to 100's m beneath the seafloor) and localized (a few 100's m in breadth) pockets of gas-charged sediment. Funding for these detailed grid surveys was paid in part by an accompanying grant from the US Science Support Program of the Joint Oceanographic Institutions, Inc.

Throughout the survey we used a single 45/45 cu. in. GI airgun tethered to float at 7 ft and fired every 12.5 m along track. Data were received on a 48-channel, 12.5 m group length, 600 m-long streamer that was monitored and controlled to tow at 7 ± 2 ft. Data were recorded at 0.5 msec intervals with an OYO DAS-1 digital system and written to 200 megabyte Fujitsu 3480 tape cartridges.

The 1076 field tapes were divided evenly between Lamont-Doherty and our colleagues at the Institute for Geophysics of the University of Texas at Austin. We coordinated our processing techniques to ensure a uniform product. All data were processed using standard techniques of common-depth-point gathering, velocity analysis, normal-moveout correction, gain adjustment, filtering and display. Predictive deconvolution to suppress multiple reflections and migration to image features with proper spatial geometry have been performed on all data.

Following represents the Final/Technical Report on:

Expansion to: **NOOO14-95-1-0200**

This contract provided funding for human support, necessary to assemble a melange of components, previously funded by DOD (DURIP) and NSF into a working, portable high resolution multichannel seismic system, and for minor but important supplementary hardware. This work was done within the anticipated time frame; the system was tested and proven usable in its intended role of supplying survey data for shallow water deep sea drilling and for the *STRATAFORM* initiative.

The Lamont-Doherty (ex-*R/V Conrad*) 10-airgun controller was refurbished and installed in an air-freightable transit rack, along with a source monitoring oscilloscope and the DigiCOURSE bird controller. After extensive research, the decision was made to buy two Seismic Services, Inc. "GI" [Generator/Injector] air guns as the seismic source. Towing bridles, harnesses and hose bundles for these guns were designed and fabricated. The airgun controller software was modified to suit the needs of the GI guns.

A used streamer winch was located and modified in the Lamont-Doherty machine shop for use with the ITI (Innovative Transducers, Inc.) solid state streamer. A dedicated hydraulic power pack was purchased and provided with appropriate hoses and connectors.

A long process of interaction with OYO Geospace Engineering Geophysics Division of Oyo Corporation USA, manufacturers of the seismic digitizing and recording system, finally produced a version of their software which would allow us to write information into the data tape headers.

Use of the system has resulted in production of a User's Manual (see Technical Report No. LDEO-96-4), and Lamont-Doherty processing software has been modified to easily handle the SEG-D data tapes.

The system has been used three times, and is now scheduled for a major deployment in the Persian Gulf during 1997.

John B. Diebold
Research Scientist

REPORT DOCUMENTATION PAGE

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13. ABSTRACT (*Maximum 200 words*)

Research grant awarded in order to plan, acquire, and process hi-resolution MCS reflection data offshore New Jersey during R/V Oceanus Cruise 270. This is part of STRATAFORM initiative which seeks geologic and geophysical data on the continental terrace at temporal and spatial scales; cruise objectives were to collect hi-resolution reflection images of stratal geometry in the upper 100+ m of sediment column from middle shelf to upper continental slope, and tie them to ODP Leg 150 sites cored and logged in 1993.

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